Impingement Survival Review

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ASA analysis & communication

Project Goals

- 1. Identify/summarize imp. survival studies
- 2. Facilitate access to reports/information
- 3. Identify factors influencing survival
- 4. Discuss use in BTA assessments

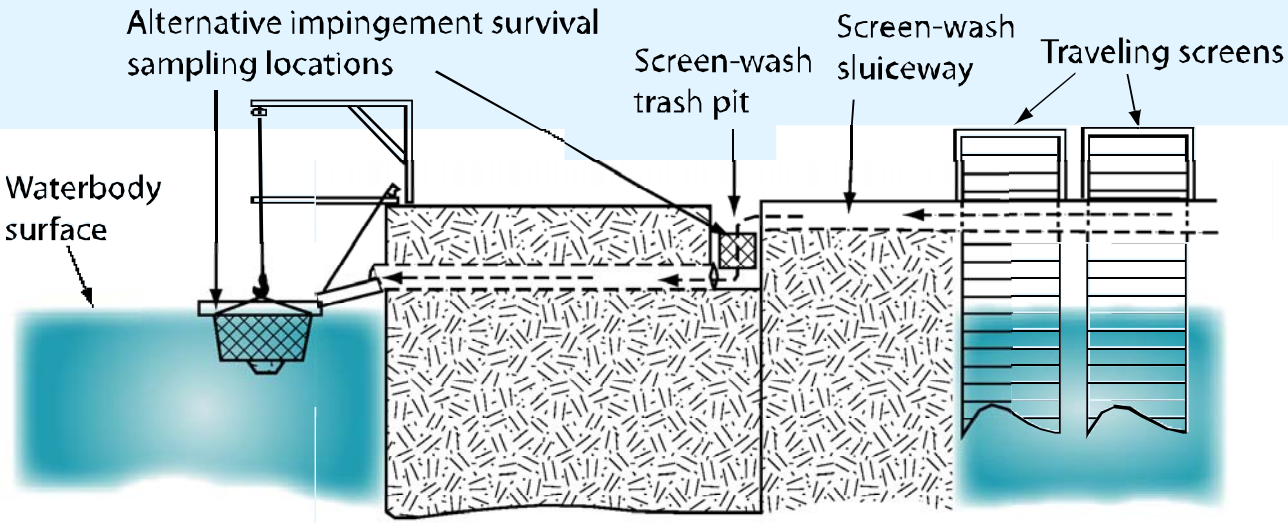
1. Summaries of the Studies

- 67 source documents identified/reviewed
- Summary of general methodology
- Summary of coverage
  - years, species, waterbodies, screen designs
- Summaries of impingement survival rates

General Methodology

- Collection from screenwash water system
- Sampling during peak or seasonal
- Initial enumeration - live, “stunned”, dead
- Latent mortality over 24-108 hrs
- Controls – some studies & species
- Survival rate = proportion remaining alive

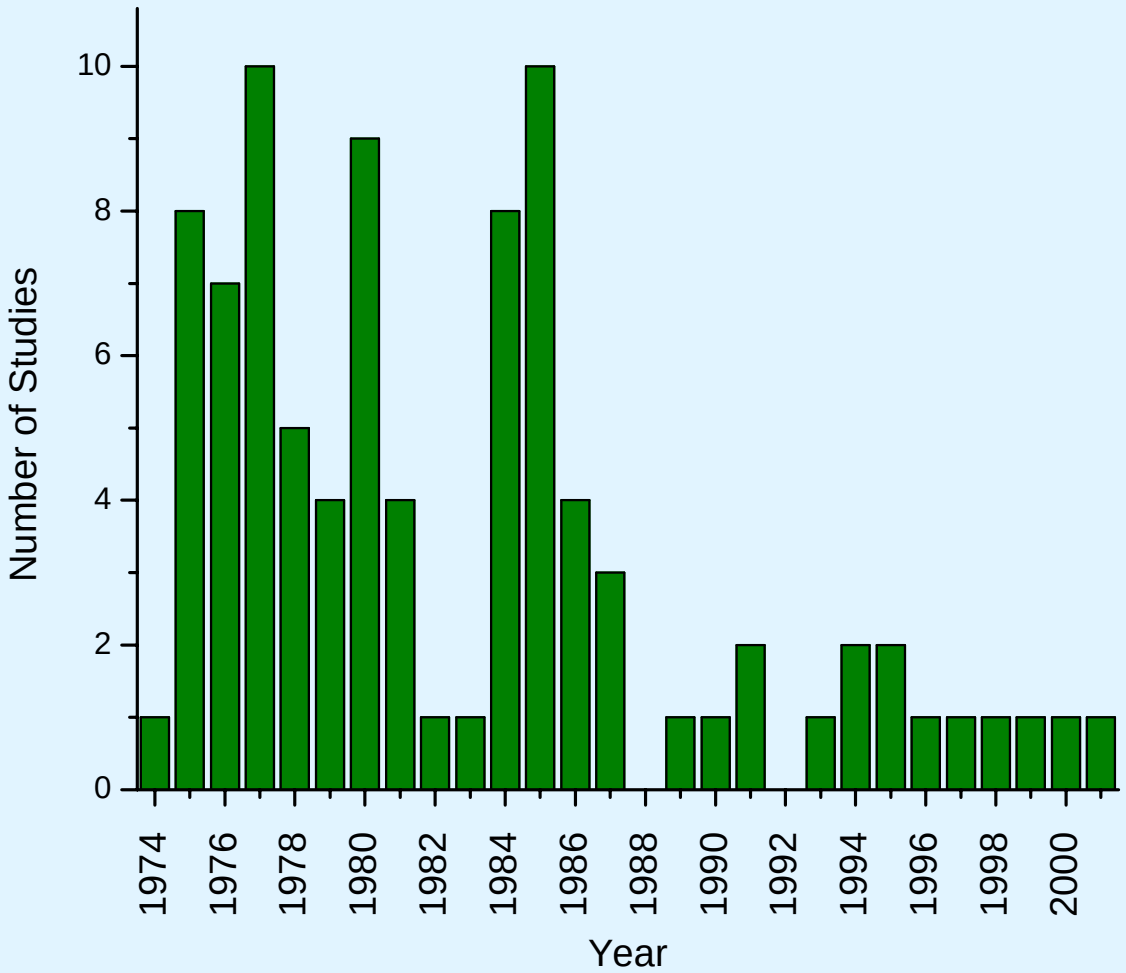
Survival Sampling Locations



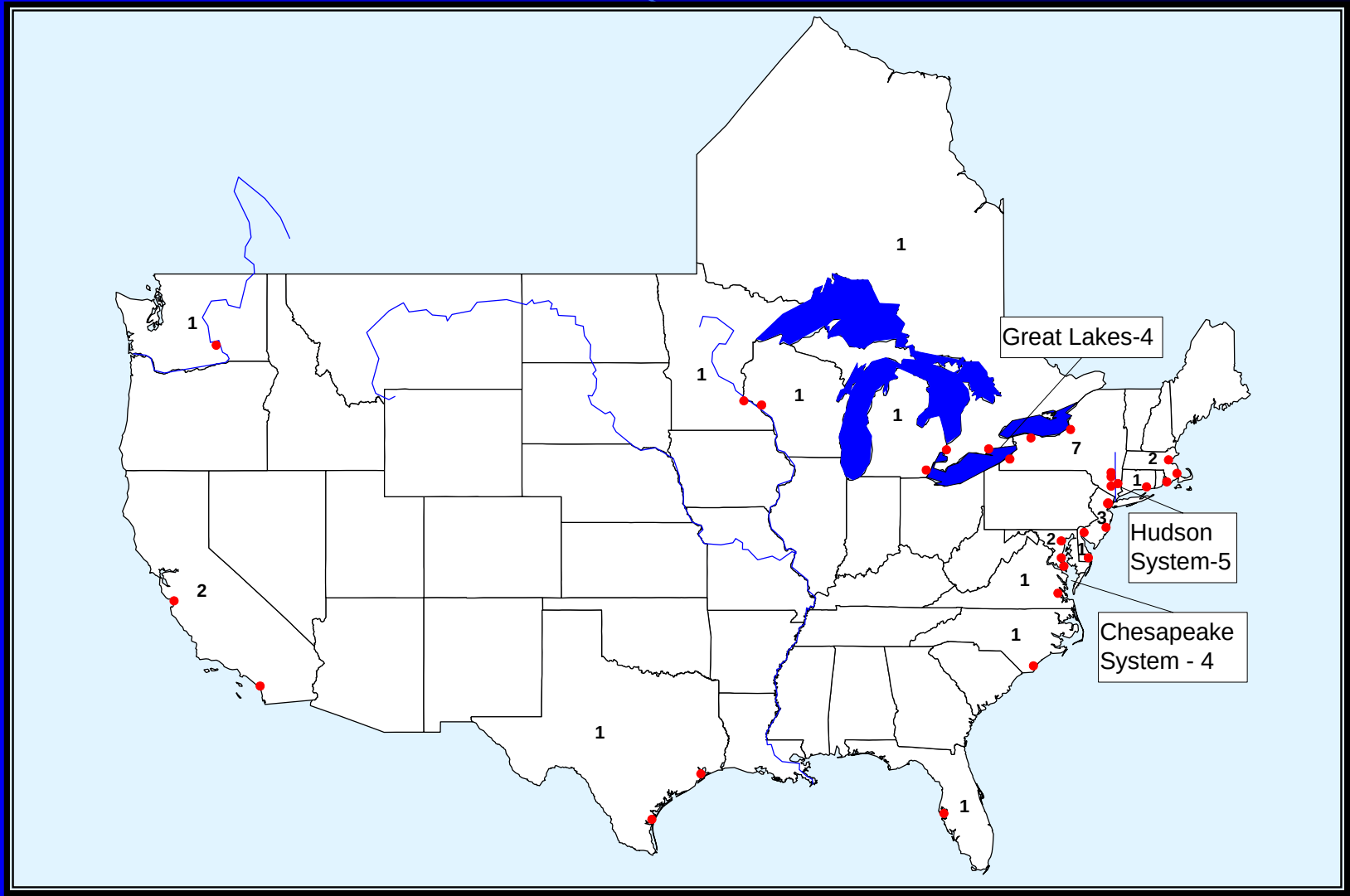
Survival Rate Measures

- Initial Survival = $P_i = A_i/N_T = L_i + St_i$
- Latent Effects Survival = $P_l = A_{l(t)}/N_l$
- Extended Survival = $P_e = P_i \times P_l$

Chronology of Studies



Geographic Coverage



Waterbody Coverage

Water Body Type	No. of Facilities	No. of Waterbodies
Freshwater stream or river	4	3
Great lake	5	2
Tidal river or estuary	16	13
Ocean	4	4

Screen Designs Studied

Traveling Screen Type	No. of Facilities
Single-Flow	23
Dual-Flow	5
Angled	4

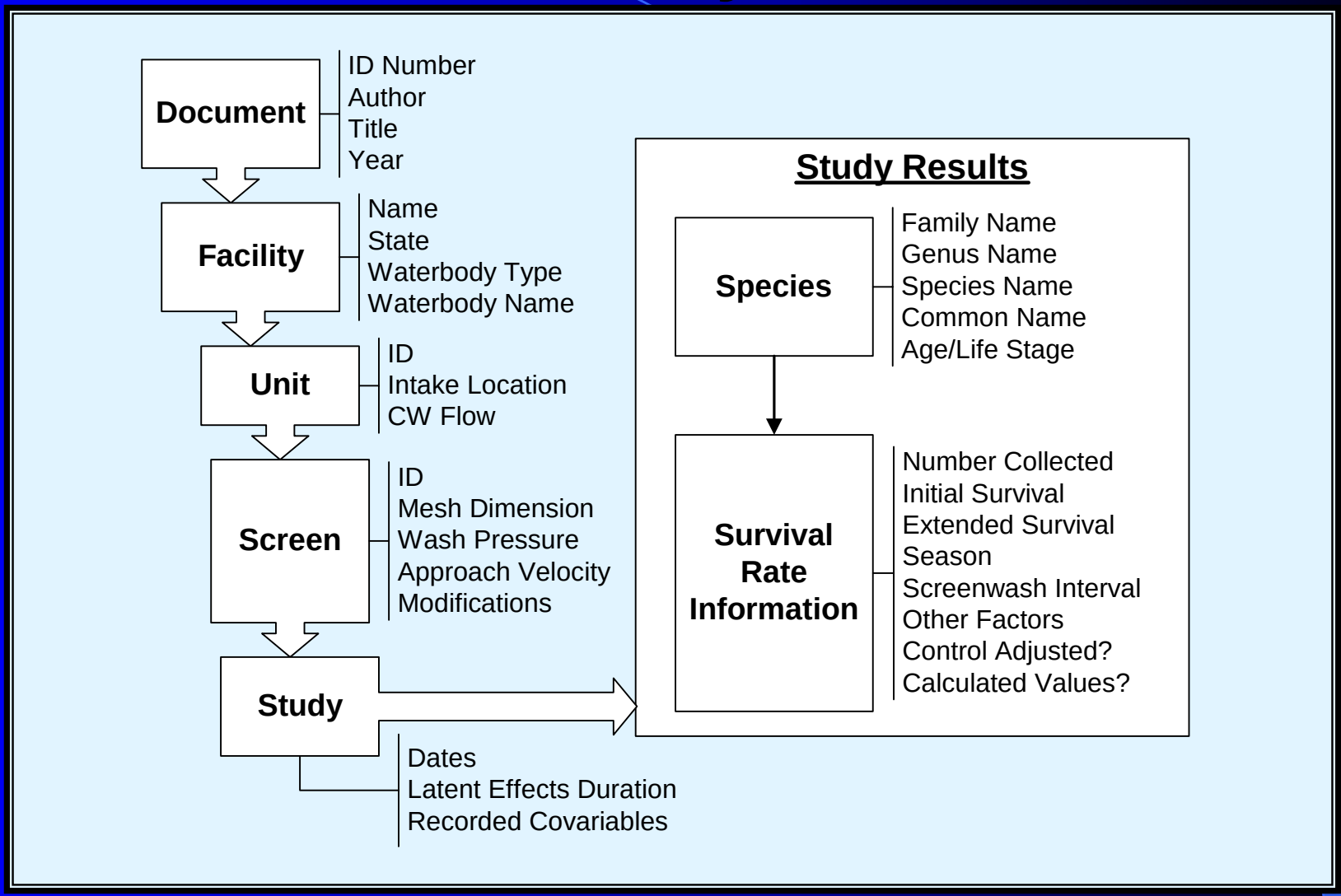
Taxonomic Coverage

Water Body Type	Total No. of Taxa
Freshwater stream or river	55
Great lake	39
Tidal river or estuary	184
Ocean	85

2. Facilitate Information Access

- Report tables
  - Descriptive information referenced to sources
  - Impingement survival rate estimates
- Database of key information
- Images of available documents on CD

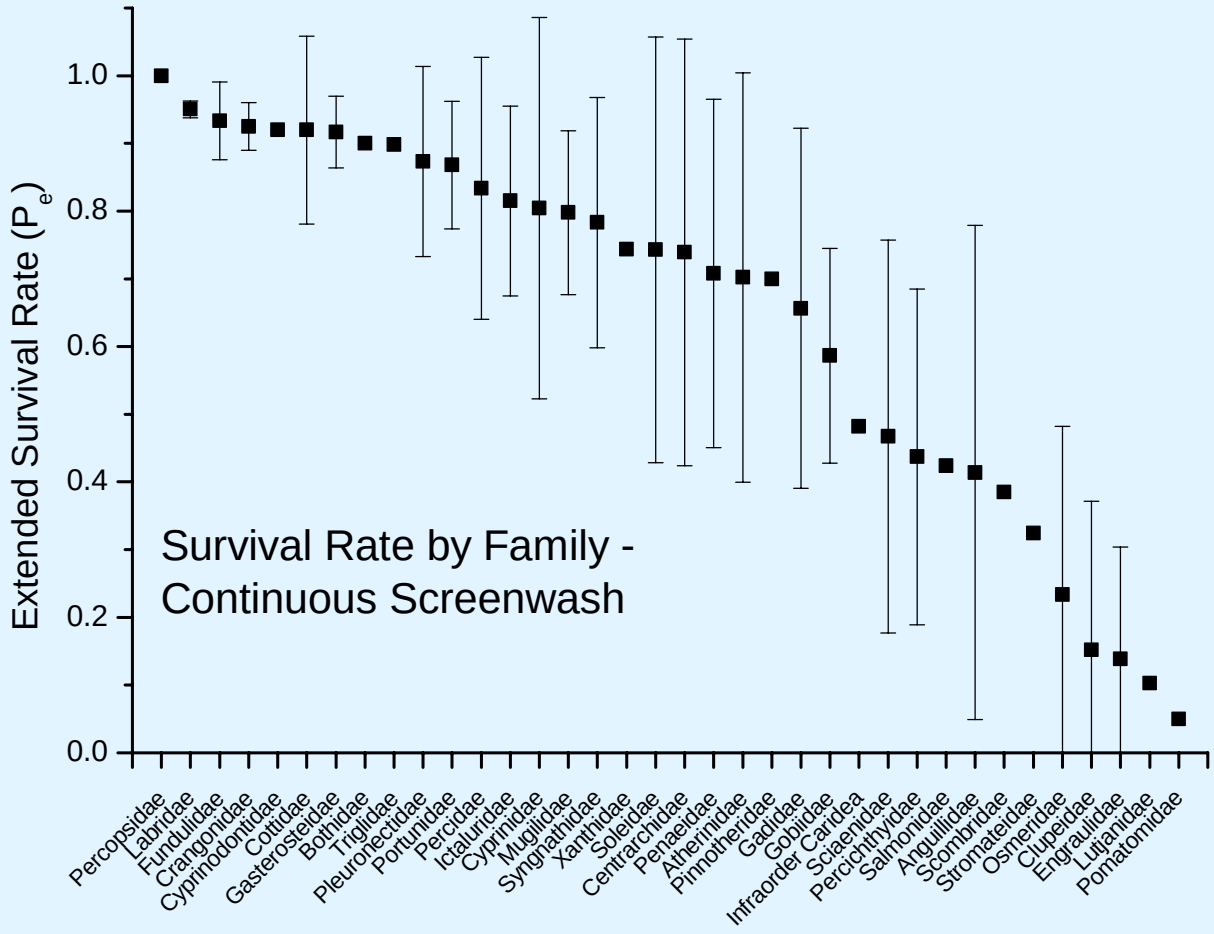
Survival Study Database



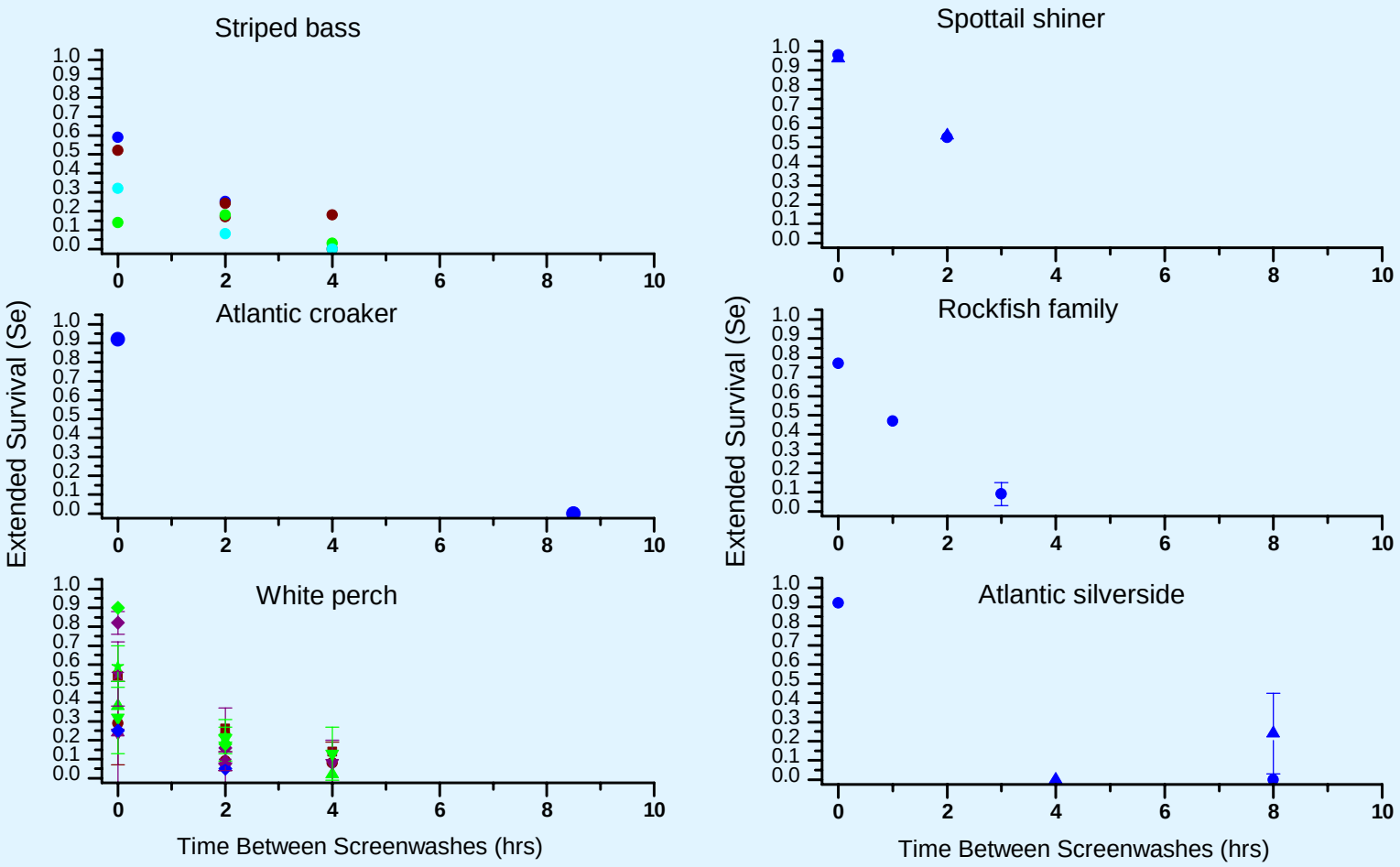
3. Factors Influencing Survival

- Factors affecting stresses
  - Screen wash frequency
  - Screen travel time
  - Modifications for fish handling
- Factors affecting sensitivity
  - Species type
  - Water temperature/season
  - Variable salinity in estuaries

Factors - Species Sensitivity



Factors – Screenwash Frequency



Other Intake Factors

- Screen rotation speed & height
- Fish handling (Ristroph) modifications

Waterbody Factors

- Loadings of debris and other organisms
- Ambient water temperature
- Salinity in estuaries

4. Uses of Prior Studies

- Defining data needs for site/intake conditions
- Selection of focal species
- Screening intake alternatives
- Benefit calculations

Potential Mortality Rate Biases

- Overestimate mortality rate
  - No correction for collection/holding effects
  - No accounting for pre-impingement mortality
- Underestimate mortality rate
  - Low screenwash collection efficiency
  - Increased susceptibility to predation